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Measuring Household Food Consumption: A Technical Guide

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Contents

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This series

This series of Title II Generic Indicator Guides was developed by the Food and Nutrition Technical Assistance Project, and its predecessors (IMPACT, LINKAGES), as part of USAID's support for its Cooperating Sponsors in the development of monitoring and evaluation systems for use in Title II programs. The guides are intended to provide the technical basis for the indicators and recommended methods for collecting, analyzing, and reporting on the generic indicators developed in consultation with PVOs during 1995/1996. The guides are available on the project website http://www.fantaproject.org

Below is the list of available guides:

Agricultural Productivity Indicators Measurement Guide Food Security Indicators and Framework for Use in the Monitoring and Household Food Consumption Indicators Measurement Guide
Infant and Child Feeding Indicators Measurement Guide
Water and Sanitation Indicators Measurement Guide

PART I.

Introduction

I.

Many private voluntary organizations (PVOs) are engaged in projects aimed at improving food security and household nutrition worldwide. The U.S. Agency for International Development (USAID) supports many of these projects through the provision of Title II food aid to PVOs designated as "Cooperating Sponsors." Increasingly Cooperating Sponsors (CS) are being asked to monitor and evaluate the impact of their interventions, and USAID is generating materials to help them in this process. USAID Missions, in collaboration with PVOs and technical staff from Regional and Central USAID Bureaus have identified a set of generic impact indicators for household food consumption, to facilitate the monitoring and reporting process.

This technical guide was developed to systematize this information. It is based around the three impact indicators defined by the PL480 Title II program's increased number of eating occasions, increased dietary diversity and increased percentage of households consuming minimum daily caloric requirements. This guide demonstrates how to measure and quantify this information.

The guide describes the process and procedures for collecting the information to assess the food-intake requirements of a household and a step-by-step analysis of the nutritional impact of the food consumed. The process begins with the design of a questionnaire; a model is provided here, but is subject to modification depending on the particular information that a given CS seeks to reveal. Filling in the questionnaire involves detailed interviews with a "respondent"(the household member responsible for food preparation) to obtain data on household composition and food consumption. The latter is gathered using a "24-hour recall" methodology, according to which the respondent is asked to recall the ingredients of each dish prepared during the previous day and the amount of that dish consumed by the household. The guide provides ideas for approximating the size of different dishes and their weight or volume and defining who is a "household member."

Once the basic information has been gathered, the methodology requires fairly complex data processing and analysis to convert information on household composition and consumption into standard formats that can be compared across households. Detailed information about analyzing household food consumption data is available in a separate Appendix. Topics covered in the Appendix include: sample ingredient codes, caloric requirement tables and sample activities grouped by activity level for males and females. The Appendix is referred to throughout the guide and is available by request from Food and Nutrition Technical Assistance (FANTA) Project, Academy for Educational Development, 1825 Connecticut Ave. NW, Washington DC 20009 - 5721.

I.

PART 2.

Impact Indicators for Improved Household Nutrition

The three PL 480 Title II impact indicators developed to measure improvements in household food consumption are:

- Increased number of eating occasions per day
- Increased number of different foods or food groups consumed (dietary diversity)
- Increased percentage of households consuming minimum daily caloric requirements.

The suitability of a given indicator depends on the program objectives, environment, and technical and financial capacity of the PVO executing the program. Advantages and disadvantages can be cited for each indicator with regard to both collecting the data and interpreting the results.

1.Increased number of eating occasions

The number of daily eating occasions is a proxy indicator for gauging the adequacy of household macronutrient (calories and protein) intake. An advantage in selecting this as an indicator of household food security is that data are relatively easy and inexpensive to collect. Data on the size and composition of meals are not required to calculate indicator values.

However, while the number of eating occasions may be a good indicator of household strategies to cope with transitory food insecurity, it is less sensitive as an indicator of changes in situations of chronic food insecurity or of micronutrient imbalances in the diet.

Moreover, interpreting data derived from this indicator is often complicated by cultural factors. In cultures where consumption of three meals per day is customary, household rationing in the face of food shortages can take the form of a reduction in the number of meals consumed. However, in cultures where households consume one primary meal per day, the volume, rather than the *frequency*, of meals tends to decline as food shortages develop. Thus measuring only the number of eating occasions will not yield significant information on household food consumption.

Another complication inherent in this indicator is the definition of a "meal," which often varies across cultures. For some, a meal is defined according to the volume and type of food consumed. For others, the time of day it is consumed is important in defining a meal. While using the term "eating occasions" helps to eliminate difficulties caused by different definitions of "meal," the term still requires careful attention to cultural factors when interpreting results. The same is true of attempts to make cross-cultural comparisons of results. Because of these complicating factors, it is recommended that the "eating occasions" indicator be used in conjunction with the dietary diversity indicator described below.

2.Increased number of different foods or food groups consumed

The number of different foods or food groups consumed in a household provides a measure of the quality of the diet by reflecting *dietary diversity*, thus serving as an important complement to the eating occasions indicators. To accurately capture dietary diversity, this indicator should be evaluated in terms of the *variety of food groups* (meats, milk, fruits, and vegetables) consumed, rather than by simply totaling all types of foods consumed. The division of food into different groups should focus on those nutrients stressed in a PVO's program strategy.

As a food-security indicator, dietary diversity is usually highly correlated with such factors as caloric and protein adequacy, percentage of protein from animal sources (high quality protein), and household income. Even in very poor households, increased food expenditure resulting from additional income can serve to increase the quantity and quality of the diet. Calculating dietary diversity requires only marginally more detailed information than is required to assess the number of daily eating occasions. Therefore, the data are still relatively easy and inexpensive to collect and analyze.

3.Increased percentage of households consuming minimum caloric requirements

The wording of the indicator included in the list of Title II Core Indicators is "increased percent of households consuming minimum daily caloric requirements." This indicator needs to be defined more sharply to accurately measure the nutrient of focus in a particular PVO program. The primary interest is generally *calories*. Thus this guide describes the processes required to gather information to measure average caloric intake at the household level, as well as rough estimates of protein adequacy. PVO programs aiming to improve household intake of other nutrients, such as Vitamin A or iron, should consult either the Micronutrient Operational Strategies and Technologies (MOST) Project or the International Vitamin A Consultative Group for specialized methodologies.

The percentage of minimum daily calorie requirements consumed provides a good indication of overall household food security. This indicator can also be used in conjunction with a measure of dietary diversity, which can be easily calculated using data collected on caloric consumption.

Despite these advantages, measuring the "caloric requirements indicator" is more costly than using other indicators, as it requires a much higher level of technical expertise and more time to collect and analyze data. While it is ideal for measuring food security, a host of factors such as the difficulties in calculating food quantities and potential changes in consumption behavior due to the presence of an interviewer make the caloric requirements indicator difficult to use in practice.

For most PVOs, a preferred alternative might be to estimate the household's consumption of minimum daily requirements, based on the ingredients of each eating occasion during the previous 24 hours, and then calculate the number of eating occasions and food diversity indicators using this detailed information. Section three offers a suggested methodology for carrying out such a survey.

PART 3.

Collecting and Analyzing the Data

The first phase of information collection calls for familiarity with local consumption patterns, to ensure that the survey tool developed is appropriate. Informal, exploratory approaches are the most useful at this stage. Information should be gathered on traditional forms and frequencies of eating occasions, standard ingredients, and household and market measuring units. Customary behavior should be identified, as should typical *variations* in behavior, particularly among targeted or food-insecure groups. With this information, the survey team can develop a set of appropriate interviewer aids, including code lists for common dishes, tools for direct measurement, and food models. Once the survey tool is complete, interviewers must be trained in the techniques described below.

Information on household food consumption should be collected using the previous 24-hour period as a reference (24-hour recall). Lengthening the recall period beyond this time often results in significant error due to faulty recall. Subsequent data collection (mid-term and final evaluations, for example) should be undertaken at the same time of year, in order to avoid conflicting results due to seasonal differences. To most accurately capture improvements in household food security, a Cooperating Sponsor (CS) should collect food consumption information during the season of greatest food shortages (such as immediately prior to the harvest).

A single 24-hour recall is usually adequate to quantify performance indicators of a program's impact over time, when the indicators are calculated as group averages; that is, the average number of eating occasions of the recipient population. However, information from several days is necessary to obtain robust estimates of household-level consumption patterns. If the CS seeks to correlate household consumption with other household variables, as well as to analyze consumption patterns and their determinants, at least four days of recall per household are recommended.

When using the 24-hour recall method, the interviewer should first ascertain whether the previous day was "usual" or "normal" for the household. If it was a special occasion, such as a funeral or feast, or if most household members were absent, another day should be selected for the interview. If this is not possible, it is better to select another household rather than conduct the interview using an earlier day in the week.

The first few steps for collecting information on the nutrient adequacy indicator provide the data necessary for other indicators, namely the number of food groups and frequency of eating occasions. Information for these indicators can also be collected using a simplified methodology, which appears below.

1. Increased number of daily eating occasions

In order to simplify data collection for this indicator, survey implementers can predefine up to seven eating occasions and ask the respondent whether or not food was consumed during these periods. An example of this method appears below.

Interviewer: During the previous 24-hour period,did you or anyone in your household consume ...

Eating occasion	Yes	No
Any food before a morning meal	1	0
A morning meal	1	0
Any food between morning and midday meals	1	0
A midday meal	1	0
Any food between midday and evening meals	1	0
An evening meal	1	0
Any food after the evening meal	1	0

The sum of "yes" responses quantifies the indicator for each household, which can then be averaged over the population of interest. Because the sum is actually the total of all household members' eating occasions, the sum will probably be larger than the number of eating occasions for any individual household member. For example, a household may report five eating occasions, whereas each individual household member may have eaten no more than three times that day.

An alternative, perhaps simpler, way of analyzing this indicator, is to calculate the percentage of households that eat "x" or more times a day. The numerator would represent the sum of households with "x" or more "yes" responses, and the denominator would represent the total number of households. This indicator can easily be modified to reflect the different number of meals consumed within a given cultural context; for example the percentage of households eating two or more times a day. The indicator should always correspond to the specific cultural context of the project.

2.Increased number of different foods or food groups consumed

For ease of analysis, the number of different *food groups* consumed should be calculated, rather than the number of different *foods*. Knowing that households consume, for example, an average of four different food groups implies that their diets offer some diversity in both macro- and micronutrients. This is a more meaningful indicator than knowing that households consume four different foods, which might all be cereals. The U.N. Food and Agriculture Organization (FAO) uses the following set of food groups in its food balance sheets:

1. Cereals
2. Root and tubers
3. Pulses/legumes
4. Milk and milk products
5. Eggs
6. Meat and offal
7. Fish and seafood
8. Oil/fats
9. Sugar/honey
10. Fruits
11. Vegetables
12. Miscellaneous

These groups can be adapted to the local context to reflect both cultural and economic patterns in food selection (e.g., "high" and "low" status foods). The list can also be expanded to specify foods of particular nutritional value, such as those high in Vitamin A or iron. The groups used for a particular survey should be meaningful with respect to the CS's program objectives and project-level interventions. For example, while including the addition of sugar or soft drinks to the list may not indicate improved nutritional status, it may be associated with increased income. This would be important to measure if the project goal is "improved food security through increased income." Nonetheless, the total number of groups included in this indicator should not be too large, as interpretation of results becomes difficult.

Fine tuning indicators

Based on dietary patterns in Honduras,where corn and sorghum constitute the basic, grain-based starch sources and rice, bread,and other grains are added as incomes increase, an indicator could separate the "cereals" group into "basic grains" (corn and sorghum.) and "other cereals" (rice, wheat,and the remaining cereals).

In programs where increased consumption of Vitamin A-rich fruits and vegetables is encouraged,an appropriate diversity indicator could separate fruits and vegetables high in Vitamin A to form another group

Once the set of food groups has been defined, data for the "number of food groups" indicator can be collected by asking each respondent a series of yes-or-no questions. This allows the interviewer to list the predominant products from each food group consumed by the respondent's household, and thus provide relevant examples for each of the food groups.

The respondent should include the food groups consumed by household members in the home, or prepared in the home for consumption by household members outside the home (e.g., at lunchtime in the fields.) As a general rule, foods consumed outside the home that were not prepared in the home should not be included. While this may result in an underestimation of the dietary diversity of individual family members (who may, for example, purchase food in the street), the indicator is designed to measure *household* diversity, on average, across all members. Including food purchased and consumed outside the household by individual members increases the risk of overestimating the dietary diversity of household members overall. However, in situations where consumption outside the home of foods not prepared in the household is very common, survey implementers may decide to include those foods when measuring this indicator. Such decisions should be clearly documented, so subsequent surveys can use the same method.

The following is an example of data collection for a number of food groups:

Interviewer: Yesterday, did you or anyone in your household consume ...

Food Group	Yes	No
Cereals	1	0
Roots/tubers	1	0
Legumes	1	0
Milk/milk products	1	0
Eggs	1	0
Meat/offal	1	0
Fish/seafood	1	0
Oil/fat	1	0
Sugar/honey	1	0
Fruits	1	0
Vegetables	1	0
Other (spices,sodas,etc.)	1	0

The sum of the "yes" responses quantifies the indicator for each household, which can then be averaged over the target population.

For a sample among three households (A, B, and C), the responses might look something like those in the box below. An answer of "yes" takes the value of 1; a "no"answer takes the value of 0.

Food Group	A		B		C	
	Yes	No	Yes	No	Yes	No
Cereals	1		1		1	
Roots/tubers	1			0		0
Milk/milk products		0	1		1	
Eggs	1			0	1	
Meat/offal	1			0	1	
Fish/seafood		0	1		1	
Oil/fat	1			0	1	
Sugar/honey	1			0	1	
Fruits	1		1		1	
Vegetables		0		0	1	
Other (spices, sodas,etc.)		0		0	1	
Total	**7**		**4**		**10**	

In this example, household C has the greatest dietary diversity, with a score of 10; household B has the least diversity, with a score of 4. The average diversity of the sample is (7+4+10) divided by 3, or 7. See the Appendix for more information.

3. Increased percentage of households consuming minimum daily caloric requirements

Two data components are necessary to quantify household caloric adequacy: *intake* and *minimum requirements*. The caloric intake estimate is obtained through recall of consumption of all significant sources of calories during the previous day (24-hour recall). This includes data on exactly what was consumed and who consumed it. An estimate of caloric requirements is calculated based on the age, sex, physiological status, and activity levels of household members consuming the calories.

3.1. 24-Hour Recall of Food Intake

The 24-hour recall gathers information on:

- Eating occasions (definition of meals/snacks or time food was consumed)
- Household members present at each meal
- Visitors consuming each dish
- Type of dish
- Ingredients of dish
- Quantities prepared of foods that are a significant source of calories
- Quantities of food not consumed by household members or guests
- Source of each ingredient (home production, purchase, gift)

If it is of interest to the CS, the 24-hour recall method can also provide information on the intake of individual household members, for example, for gender-disaggregation purposes. This requires estimating individual consumption through individual portion sizes. This guide does not provide detailed instructions for measuring individual intake.

A 24-hour recall of food consumption collects information on food intake over the previous 24-hour period. The household member responsible for food preparation is the preferred survey respondent. Others rarely know what food was consumed by individual household members. Nor are others likely to be able to identify or recall the ingredients used in meal preparation. For ease and accuracy of data collection and analysis, the reference period for 24-hour recalls should be the day before the interview. This provides the respondent with a clearly defined beginning and end of the reference period. The interviewer should ask about all foods consumed in the household the previous day, beginning when the first person in the household woke up, and using that as a reference point to start the day's recall. The respondent is then asked about all foods prepared and/or consumed until the last person in the household went to bed.

Sample interview (I=Interviewer, R=Respondent)

I: Who was the first person in the household to wake up yesterday?
R: I was.
I: After you woke up, what was the first thing prepared or consumed in the household?
R: I always make coffee first.
I: Did you make coffee yesterday?
R: Yes.
I: At what time?
R: At about 5 a.m.
I: Did you consume the coffee with something else or only had the coffee?
R: Alone.
I What were the ingredients in the coffee?
R: Coffee and sugar.
I: Do you sweeten all the coffee at once, or does each person sweeten their own cup?
R I sweeten the whole thing.
I: What was the next thing prepared or consumed after the coffee?
R: I made breakfast:plantains and eggs.
I: (Asks for and writes down all the ingredients of each dish consumed at breakfast). Was there any beverage with breakfast?
R: No.
I: What was the next thing prepared or consumed after breakfast?
R: Lunch.
I: Did anyone in the household eat anything between breakfast and lunch? For example, a fruit or cracker or milk for the baby?
R: Oh yes,the kids ate mangoes.
I: (After requesting information on the ingredients of each dish after lunch).What was the next thing prepared after lunch?
R: We had rice and beans for dinner.
I: (Notes all the ingredients of each dish consumed at dinner) Was any beverage served with dinner?
R: No.
I: Did anyone in the household eat or drink anything

after dinner? For example, a cup of coffee or a piece of fruit or milk for the baby?
R: No, we just went to bed.
I: Did you all go to bed at the same time, or did some household members stay up later than others?
R: I am the last one to go to bed.
I: Did you eat or drink any last thing before going to bed?
R: No.

The interviewer will first lead the respondent through the entire day, recording the dishes and ingredients consumed. This permits the respondent to follow a logical memory sequence all the way through the day, without constantly changing focus from *what* was consumed to *how much* was consumed. Then the interviewer will return to the beginning of the 24-hour period to obtain information on the *quantity of the ingredients that are important contributors of calories.*

3.1.1. Filling in the Questionnaire

Figure 1 presents a sample questionnaire for recording 24-hour food consumption recall information. Detail is provided in this section on how to fill in the various columns of the questionnaire.

Column 1: Eating occasions are recorded in Column 1. The information is used to identify household members present during the time the food was consumed. An eating occasion is identified when food is prepared for, or distributed to, one or more household members for their consumption. Eating occasions are numbered consecutively, starting with 1, regardless of whether they were a "meal" or "snack" and of how many people were present. If a pot of porridge was prepared at 6 a.m., and the first household members were served at 6 am, another at 6:30, and the final member at 7:30, this should be recorded as *one* eating occasion.

Column 2: Columns 2 through 8 list information on the people who did, or did not, consume the food served at each eating occasion. Column 2 lists the codes of those household members *not present* during the eating occasion. The cell of column 2 corresponding to a specific eating occasion can contain multiple household ID codes. These codes *should not* be entered vertically, (one per row); accounting for multiple codes takes place at data entry. If a

Figure 1: Sample questionaire layout

	(2)	Visitors										
(1)	ID of household Members not	Adults 18yrs		Adolescents 12-17 yrs		Children either sex						
Eating occasion	present not eating	(3) male	(4) female	(5) male	(6) female	(7) 5-11 yrs	(8) 0-4 yrs	(9) Dish #	(10) Dish	(11) Dish code	(12) Ingredient	(13) Ingred. code
										See list 1		See list 2

(14) Total prepared quantity	(15) Unit of measure	(16) Unit code	(17) Leftover quantity	(18) Source	(19) Source code
9999= Don't know	See list 3		9999= Don't know	01. Purchase 02. Home consumption 03. Gift 04. Govt. program 05. Wild food 06. Other 07. Leftovers from same day 08. Leftovers from previous day 99. Don't know	

Notes:
1) Due to space limitations, this sample questionnaire has been split into two parts. In an actual questionnaire the information in each row would be continuous across all columns.
2) If possible, codes should be included at the bottom of the relevant column. The codes in Figure 1 are an example. The appropriate list of codes is determined by the thematic interests of the survey designers and should be refined during the pre-test. Long lists of codes, such as dish/ingredient, and unit of measure, should be referenced at the bottom of the appropriate columns, and made available in a separate document.

household member was present during the meal, but did not eat, or did not eat all dishes served, that member's code is *not* recorded in Column 2. If a household member was not present, but took food to consume outside the home, that person's code is *not* recorded in Column 2.

All of the following examples are cases in which a household member should be considered "present and eating" during the eating occasion. In other words, the member's code *should not* appear in Column 2.

- Household member 01 takes a home-prepared lunch to the fields, and member 02 takes a lunch to school. Remaining members consume the same (or different) dishes at lunchtime at home. Neither member 01 nor 02 should be noted in Column 2 when the dishes served at lunch to the remaining members at home are recorded. The food prepared for 01 and 02 in the morning is recorded, the food prepared at lunch is recorded, and the total amount of food is divided among all household members.
- Household member 02 is sick at home and does not eat any lunch.
- Household member 02 doesn't like eggs and only eats tortillas and beans at breakfast.
- Each household member eats a separately prepared breakfast at different times during the morning. For example, member 02 eats breakfast at 7:00 am and leaves for school, member 03 eats at 8:00 am and leaves for work, and member 01 breakfasts at 8:30 am. Therefore all members breakfasted; all were present and ate, even though at different times. The breakfasts are all considered as the *same eating* occasion.

Columns 3 - 8 list the number of *visitors* in each age/sex category who ate each dish. While household members are recorded by eating occasion or meal, visitors are recorded by *dish.* Visitors are broken down into age/sex categories that cover a range of adult equivalents. During data analysis, a weighted "average adult equivalent" will be assigned to each of these categories.

Columns 9 - 11: The name of each dish prepared is recorded in Column 10 and coded in Column 11. A "dish" can either be a cooked combination of ingredients or an uncooked food (in the latter case, the dish is essentially equivalent to the ingredient). Dishes for which a liquid is mixed with a solid before serving (such as milk and bread, broth and rice, milk and tortilla) should be noted as a single dish; the liquid and the solid are listed as ingredients. This will facilitate the measurement of leftovers. For ease of subsequent data analysis, dishes are numbered consecutively in Column 9.

Columns 12 and 13 repeat the dish and its code. A measure of the total quantity of the dish is recorded in the same row. The ingredients of the dish are then recorded under the dish name in consecutive rows down Column 12, leaving two spaces between the last ingredient of one dish and the first ingredient of the next dish listed. When the dish and the ingredient are the same, it is not necessary to repeat the ingredient, unless precise information on the weight of the food would be lost if it were not repeated as an ingredient.

A four-digit coding scheme is used for dishes and ingredients, allowing for greater flexibility in determining the easiest and most accurate method of measurement. A given ingredient may pass through several stages before being cooked. For example, it may start out raw, then be soaked, then ground, then boiled. An estimate of the quantity prepared may be obtained at any stage, although it may be easiest to estimate quantity when the ingredient is raw or after it has been ground. The first digit of the four-digit code corresponds to the state in which the quantity estimate was obtained, not to how the ingredient was ultimately prepared. The next three digits are used to identify the ingredient.

Survey implementers must determine the appropriate items to include under "form of preparation." If more than nine forms are listed, a five-digit code can be used, of which the first two digits should be for coding the form of preparation.

Sample: Form of preparation codes

Code	Form	Code	Form	Code	Form
0	Raw	3	Stewed	6	Ground
1	Boiled	4	Broiled	7	Juice
2	Fried	5	Baked	8	Soup

Sample:Ingredients codes

Code	Food	Code	Food
001	Dry white corn kernel	084	Squash sliced
002	New white corn kernel	100	Liquid whole milk
003	White corn tortilla	101	Powdered whole milk
004	White corn on the cob	102	Powdered baby formula
005	White corn unhusked	160	Veg.shortening
006	1st quality rice	161	Lard (pig)
007	2nd quality rice	162	Vegetable oil
008	3rd quality rice	170	Refined white sugar
080	Potato	171	Refined brown
081	Sweet potato	172	Raw sugar
082	Cassava	220	Garlic
083	Squash whole	221	Onion

Coding different ingredients

Corn provides a good example of the issues involved in codifying forms of preparation and measuring quantity. The corn used to make tortillas passes through several stages.Generally, dried corn kernels are cooked,and then ground into a crude cornmeal.It may be easiest to estimate the quantity of dried kernels the respondent took from a sack, or the quantity of cooked kernels taken to the mill,or the quantity of ground corn made into tortillas. For example, 450 ml. of dried corn expands to 1300 ml. after cooking, then reduces to 700 ml. after grinding.The survey respondent can demonstrate the amount of any of these forms, depending on which is easiest to measure. In all cases,the interviewer will record the dish as "tortilla" and the ingredient as "corn." What will vary is the coding of the ingredient,to indicate the form in which it was measured.

(10) Dish	(11) Dish code	(12) Ingredient	(13) Ingred.code	(14) Quantity	(15) Unit of measure	(16) Unit code
Tortilla	1003	Tortilla	1003	35	B2	19
		Dry white corn	0001	450	ml	06
Tortilla	1003	Tortilla	1003	35	B2	19
		Cooked white corn	1001	1300	ml	06
Tortilla	1003	Tortilla	1003	35	B2	19
		Ground cooked white corn	6001	700	ml	06

Another example of the intricacies of coding is soup. Broth from soup is a common weaning food. Nutrition education programs often encourage mothers to thicken the consistency of the soups they serve their infants.If a child is served soup or broth at a separate eating occasion,the interviewer must verify whether the soup served to a child included solid ingredients,or just broth.The soup form of preparation code (8) should be reserved for soup with solid ingredients. A separate dish/ingredient code should be identified for broth (See Appendix, Sample Ingredient Form Codes,code 406).

Columns 14-16 are for listing the quantity of the dish prepared and selected ingredients. If the pot or container in which the dish was prepared is available and empty, estimating the amount of the dish is relatively straightforward. If the pot is unavailable, or the total amount of the dish is too large, the interviewer may ask the respondent to measure the portion served to each individual and estimate the amount remaining in the pot. The interviewer can then add up the individual servings plus leftovers, and enter the sum as the total amount of the dish prepared. The leftover measure would also be entered separately in Column 17.

If large amounts of a dish are prepared for several days at a time, it is impractical to try to measure the total amount of the dish prepared, and then measure the amount remaining in the pot after each meal. In this case, the interviewer would not record and measure individual ingredients. Instead, the respondent should be asked to demonstrate the amount of the cooked dish served from the pot to each individual. In this case leftovers are not estimated, since leftovers at the *household* level refer to leftovers in the pot, not on each member's plate. Given that the objective of the study is to calculate average household consumption, obtaining details on individual leftovers is too demanding and time-consuming to be worth the additional precision gained. Clearly, however, individual leftovers should be estimated when individual intake is of interest to the survey implementer.

The quantity of the dish and its ingredients are recorded separately. If the respondent states, "I cooked one pound of rice," the quantity is "1," and the unit of measure is "pounds." The quantity (number of units) is recorded in Column 14, and the unit of measure in Column 15. The unit of measure recorded should correspond to one on the precoded unit-of-measure list. (See Appendix, for a sample listing of measurement codes.) Common household units of measure (cup, glass, spoon, recycled can, bottle, bowl, or gourd) should *not* be recorded. For example, if the respondent used a coffee-cup full of sugar to make juice, the interviewer must not record "1 cup of sugar" because the size and shape of coffee cups vary, as do the levels to which a respondent may have filled the cup. The interviewer can determine the volumetric equivalent of the amount of sugar by asking the respondent to fill the same coffee cup with rice to demonstrate the amount of sugar used, and then recording the quantity of milliliters.

It is not necessary to estimate the amount of water in coffee, tea, reconstituted milk/formula, juice, etc. The interviewer need only obtain quantity estimates for ingredients that are significant sources of calories (such as powdered milk, formula, or sugar) and the total amount of the dish.

Column 17 notes the quantity of the dish *not consumed* during the eating occasion. This "leftover" amount may include portions sent to neighbors, fed to animals, or discarded, as well as portions set aside for subsequent consumption by household members. *The measurement of leftovers must always use the same unit of measurement as the dish.* If a different unit of measure is used, the data analyst will not be able to estimate what proportion of each ingredient in the dish was not consumed.

One or more days worth of foods, such as flat breads and rolls, may have been made during the recall period. For example, in Honduras some housewives grind enough corn and make enough tortillas for the entire day at one sitting, while others grind corn and prepare tortillas before each meal. When the whole day's tortillas are prepared at once, it is often difficult for the survey respondent to recall the total number of tortillas prepared. In such cases the interviewer can prepare a matrix (as in the example below); the respondent is more likely to recall how many tortillas were served to each person at each meal. The columns of the matrix can then be added together to provide the total number of tortillas prepared, the amount left over and consumed at subsequent meals, and the amount not consumed that day.

Creating a matrix

The respondent prepared tortillas for the entire day at breakfast time. All household members ate all meals,and there were no visitors.The interviewer creates a matrix of meals consumed by household members, and asks the respondent to recall how many tortillas each member ate at each meal.The interviewer then asks if any tortillas were eaten as snacks,given to animals,given away, sold,or uneaten (left over).

The respondent recalls that Pedro ate four tortillas at breakfast and dinner and five at lunch.Maria ate two at each meal. Juan ate three at each meal and three for a snack.Elsa ate one tortilla at lunch.Six tortillas were given to the pigs,and 3 tortillas were left over at the end of the day

	Breakfast	Lunch	Dinner	Snacks	Animals	Leftover	**Total**
Pedro	4	5	4				
Maria	2	2	2				
Juan	3	3	3	3			
Elsa		1					
Total	**9**	**11**	**9**	**3**	**6**	**3**	**41**

The interviewer notes the total number of tortillas *prepared* (not the number consumed) at breakfast,which is the sum of the total of all columns in the matrix.The interviewer then records the total number of tortillas *not consumed at breakfast* as leftovers.The difference between the total number prepared and the number left over is the number consumed.The interviewer must not record the amount of leftovers again; for each subsequent occasion of tortilla consumption,only the amount *consumed* is recorded.

On the questionnaire, the sum of tortilla quantities from column 14 minus the sum of tortilla quantities should yield the total number of tortillas consumed in the household that day (after subtracting leftovers and animal feed).

(1) Eating occasion	(10) Dish	(11) Dish code	(12) Ingredient	(13) Ingred. code	(14) Total prepared quantity	(15) Unit of measure	(16) Unit code	(17) Leftover quantity	(18) Source	(19) Source code
1	Tortilla	1003	Tortilla	1003	41	B1	18	32		
			Dry corn kernel cooked	1001	1200	M1	06		Home prod	03
2	Tortilla	1003	Tortilla	1003	11	B1	18		Leftover same day	07
3	Tortilla	1003	Tortilla	1003	3	B1	18		Leftover same day	07
4	Tortilla	1003	Tortilla	1003	9	B1	18		Leftover same day	07

Columns 18 and 19 reflect the source and code(s) of food prepared and consumed in the household. The level of detail in the code list depends on the objectives of the study. However, at a minimum, it is useful to use at least five "source" categories: purchased, home produced, private gifts, government programs, freely gathered, and other. The source of the food also includes leftovers from the same day or previous days. The code "leftover from same day" helps the data analyst identify pre-cooked dishes for which household-specific recipes should be available. Leftovers from other days will have household-specific recipes imputed if available; if not, cluster- or domain-specific recipes will need to be calculated for commonly cooked dishes. Methods for carrying out these calculations are described in the Appendix.

3.1.2. General Measurement Techniques

Food intake can be estimated in four different ways:

1. Recorded weight
2. Volume
3. Two-dimensional food models
4. Linear dimensions.

Each of these methods has an important and specific role to play, and different foods are measured differently. Methods 1 and 2 are preferable, but not always feasible. Method 3 uses preselected, pretested models that reflect the local context in terms of the types of foods available and the form in which they are generally acquired and consumed. Success in implementing these techniques in the field is highly dependent on the quality and depth of interviewer training.

3.1.2.1. Recorded Weight

Ideally, the interviewer will be able to record the weight of the food prepared or consumed. This will be easiest when the respondent purchased a pre-measured amount of a food and prepared it in its entirety during the recall period. For example, the respondent bought one-half pound of sugar and used it all to make lemonade, or bought a 350-gm. bag of rice and cooked it all at once. The respondent may know the exact weight or volume of a product if it was pre-packaged, or if it was bought by the pound and weighed on a scale at the time of purchase. If a product was purchased prepackaged, but the respondent does not know the weight, the interviewer should ask to see the package. Cans and bags are often kept for reuse. If the package or container is no longer available but was purchased at a local retail outlet, the interviewer can visit the store after the interview, identify the same brand and price, and directly ascertain the weight of the product. If the net weight on the can or container includes water (such as canned peas), the weight from the container should not be used. Instead, the interviewer should estimate the volume of the drained product (see next section).

In many countries respondents may imply that products have been weighed, when in fact they have not. For example, in the Dominican Republic beans are commonly sold in the market by the canful. Sellers use a can to measure the beans, which is commonly referred to as "one pound." Samples taken of the measure, however, averaged only three-quarters of a pound. In Honduras people commonly refer to a prepackaged bag of rice as "1 pound," even though the package clearly states the weight as 350 grams. Thus when respondents provide an oral account of the weight of a product, interviewers should always ask if the product was actually weighed. It is important that these types of distortions be identified during questionnaire design and pre-testing and highlighted during training.

Many other factors may prevent respondents from providing reliable information on the weight of a food prepared or consumed. For example, if the food: (a) came from the household's own agricultural production; (b) was bought without being weighed; (c) was a gift of raw or cooked food; (d) was purchased by weight, but not prepared or consumed in its entirety; or (e) is a cooked dish or an individual portion, then the interviewer must estimate the amount prepared or consumed. Several techniques are available to do so. They require that interviewers carry with them aids such as rice, clay, beakers with graduated measurements, and in some cases, cardboard models.

3.1.2.2. Volume

To convert household measures to volume, the respondent is first asked to demonstrate the amount of the product prepared or consumed using the household measure (cup, spoon) she actually used. Then water or rice is used to substitute for the product. The interviewer will carry four or five pounds of rice to be used to demonstrate the amount of dry ingredients, especially those that tend to mound when measured (such as flour, powdered milk, and sugar). Rice can also be used to estimate portions of an already-cooked, non-liquid dish; for example, if a neighbor sent over a plate of rice and beans, or if leftover porridge from a previous day was consumed. Water can be used to substitute for all liquid ingredients, as well as ingredients measured with a level surface (such as a level teaspoon of sugar or liquid milk). The total amount prepared can also usually be estimated by volume.

After the respondent replicates the amount prepared or consumed in the container used, the interviewer transfers

the rice or water to a measuring beaker. The beaker should always be the smallest possible, because smaller beakers tend to have finer gradations (by 5 or 10 ml., instead of 25 or 50 ml.), so the amount can be read with greater precision. After placing the beaker on a level surface, at eye level, the interviewer reads the volume and records the amount in milliliters.

Measuring the volume of coffee and sugar

The respondent has a sack of sugar and a small cup that she uses to remove sugar from the sack before adding it to coffee. The interviewer asks the respondent to demonstrate using the same cup and the study rice the amount of sugar she used yesterday in the morning coffee. The respondent fills the cup with rice to where it was filled with sugar; the interviewer empties the rice into a beaker and records the quantity in milliliters.

Then the interviewer asks the respondent to fill the coffeepot used yesterday with water to the level it was filled with coffee. This amount is measured in the beakers and recorded as the total amount of the dish prepared. The interviewer asks if any coffee was left in the pot after everyone had been served; if so, the respondent is asked to demonstrate by placing water to the level of leftover coffee in the coffeepot. The interviewer records this amount in the total dish leftover column.(Fig.1)

Another example comes from a study in Honduras, where vegetable shortening (*manteca*) is commonly used for cooking. The product is usually squeezed from a plastic tube into the frying pan, then heated. In this case, respondents were asked to estimate the amount of *manteca* after it had melted in the pan by adding water to the empty pan until the quantity replicated the amount of melted *manteca*. The water was measured in the beaker, and milliliters of *manteca* recorded on the questionnaire. This technique can be used with any solid fat that is melted before cooking.

Another way to measure volume is by *water displacement*. This is particularly useful when the ingredient or dish prepared or consumed is measured in individual units, such as a roll, piece of meat, or block or slice of cheese. Interviewers request that respondents use clay to model the shape and size of the food. Then the interviewer fills a beaker with water to a level high enough to cover the modeled product, and notes the level of water in milliliters. Finally, the interviewer places the clay model in the water, and notes the new water level. The difference between the two levels is recorded in millileters on the questionnaire.

Measuring the volume of cheese by water displacement

If a respondent purchased a portion of cheese but did not serve all of it yesterday, the interviewer can estimate the amount of cheese consumed by asking the respondent to make a clay model similar to the size and shape of the cheese when originally purchased. Having filled a 1000-ml. beaker up to the 600 ml. mark, the interviewer places the clay model in the beaker and notes that the water level has risen to 850 ml. Thus the volume of the original portion of cheese was 250 ml. The interviewer then asks for a model demonstrating the amount of cheese not served. Making sure that the beaker still has 600 ml. (the water level may drop as the clay models are removed), the unconsumed cheese model is placed in the water, which rises to the 700 ml. mark, allowing the interviewer to calculate the amount of cheese consumed the previous day. (Fig.2)

Note: Strictly speaking, repeating fresh cheese on the second line is not necessary, because the conversion factor for milliliters to grams for fresh cheese would be available from secondary data or survey implementer calculations. However, when exact and direct information is available, for example, on the weight of the 250 ml. of cheese purchased by the household, it is preferable to record it for subsequent use by data managers in calculating a household-specific conversion factor of milliliters to grams

Figure. 1 Measuring the volume of coffee and sugar

(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
Dish	Dish code	Ingredient	Ingredient code	Totally prepared quantity	Unit of measure	Unit code	Leftover quantity
Coffee	1220	Coffee	1220	1050	MI	06	200
		Coffee	0220				
		White sugar	0170	240	MI	06	

Figure. 2 Measuring the volume of cheese

(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
Dish	Dish code	Ingredient	Ingredient code	Quantity	Unit of measure	Unit code	Leftover quantity
Fresh cheese	0104	Fresh cheese	0104	250	ml	06	100
		Fresh cheese	0104	1	lb	01	

Conversion factors for all foods measured by volume will need to be obtained. Some such factors are available from nutrient composition tables that list, for example, the volume of a standard 8-ounce measuring cup: the standard 8-oz. cup contains 236.6 ml. The weight of one cup of the product divided by 236.6 will give the conversion factor to grams for one milliliter of volume of the product. Some volumetric conversion factors for common foods in Honduras, used in a 1994 survey, are included in the Appendix. For conversion factors of foods not included in nutrient composition tables in the Appendix, survey implementers will need to calculate survey-specific conversion factors. To do so, the implementers should purchase a sample of different weights of the product of interest. The volume of each sample should be measured, using the most appropriate technique (directly for dry or liquid ingredients, water displacement for solid ingredients, if possible). The volume-to-gram conversion factor for each sample is then averaged to obtain a milliliter-to-gram conversion factor for the product.

3.1.2.3. Two Dimensional Food Models

Some foods are consumed unweighed, and cannot be easily measured through volumetric conversion or clay models. In such cases, a two-dimensional cardboard model can serve as a measurement tool. A common example is bananas; two-dimensional models are necessary for most fruits, vegetables, roots, tubers, and some meat and dairy products. Two-dimensional cardboard models should be developed for these foods prior to initiation of the field activities.

A cardboard model is created for each of a series of common sizes and shapes of a given product and each interviewer is given a full set. When the models are made, the gross and net weight of the edible portion of a sample of each food model must be calculated for data-processing purposes. For example, in the case of bananas, five to ten bananas are selected that are the same shape and size as the models. Each banana is weighed with skin, and the gross weight noted. Then each banana is peeled and weighed without skin to measure the weight of the edible portion. Finally, the gross weight and edible portion weights are averaged and recorded for use during data analysis.

When the interviewer determines that models are necessary, he or she will demonstrate the range of models available for the particular food item, and ask the respondent to indicate which size best corresponds to the amount of the food prepared or consumed.

Most food models are two-dimensional; that is, they show the length and width of the product, but not its thickness. It is possible, however, to develop cardboard food models to measure thickness. Flatbreads, such as tortillas, may vary widely in both diameter and thickness in different regions of a country. Using cardboard that is approximately as thick as the thinnest commonly observed bread, survey implementers can create a set of models covering several different thicknesses. Interviewers can then ask respondents to indicate both the size of bread or tortilla and the thickness, using the different cardboard models. Model sizes can be coded using letters, and the number of models coded by number. For example, if a respondent selects two thicknesses of model size B, the interviewer would record "B2" with the corresponding code for the list of units of measure. These food models should be included on the unit of measure code list (see the series of tortilla models listed in the Appendix.

Roots and tubers, such as cassava, pose a special challenge. They are often obtained from the household's own agricultural production, so the respondent does not have a reliable weight to report. Moreover, the size and shape of roots varies enormously, and it may be difficult to produce a sufficient range of food models to cover all possibilities. Finally, when prepared, the root may be cut into several pieces of varying shapes and sizes, and individuals may eat varying number of these pieces.

Food models for roots and tubers should be developed to cover three-to-five sizes and one-to-three shapes. To estimate

the *quantity* of the ingredient, the respondent is asked to select the size and shape closest to that prepared. The respondent may select several models to demonstrate the range of shapes and sizes prepared. The respondent is then asked how many pieces each root was cut into, the sum of which is recorded as the total amount of the dish. Individual portions will then be defined as the number of pieces. When the data is analyzed, the total weight of the sum of the food models (ingredients) is divided by the total number of pieces to calculate an average weight per piece. (Fig.3)

3.1.2.4 Linear Dimensions

The amount of some foods–most commonly already cooked square or rectangular foods received as gifts or purchased–can be estimated using their dimensions. One Latin American example is the tamale. The respondent can be asked to draw a rectangle to estimate the length and width of the food, and to indicate the height with the distance between two fingertips. The interviewer records the information as "cubic centimeters."

However, if the respondent prepared tamales in the home during the reference period, it is not necessary to estimate the dimensions of the finished tamales in this manner. Rather, the interviewer should record all the ingredients and their respective quantities. To obtain the total amount of the dish, the interviewer records the total *number* of tamales made, using the slice/piece unit-of-measure code.

Figure. 3 Estimating the quantity of cassava consumed

The respondent prepared four cassava roots, two of which correspond to the large food model, and one to the medium model;the fourth root was approximately half again as big as the medium food model (i.e.,1.5 medium).She cut each root into six pieces and then into 24 smaller pieces before cooking. Two pieces were fed to the pigs.

(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
Dish	Dish code	Ingredient	Ingredient code	Totally prepared quantity	Unit of measure	Unit code	Leftover quantity
Boiled cassava	1082	Boiled cassava	1082	24	piece	08	2
		Cassava	0082	2	large	11	
		Cassava	0082	2.5	med.	10	

3.2. Recording Household Composition

Caloric requirements of household members are based on their gender, height, weight, physiological status, and level of activity. For the purposes of quantifying the Title II caloric adequacy indicator, average heights and weights for the country should be used. Figure 4 presents the layout of a sample questionnaire for collecting the additional information required to calculate caloric requirements for each household member.

3.2.1. Age

For the purposes of the caloric adequacy indicator, age in years completed is collected for all household members over one year of age. Age in months is needed for children younger than one year.

3.2.2. Gender

The gender of each household member is recorded. Females do not need to be identified here as pregnant or lactating, as this is recorded in the column on physiological status.

3.2.3. Physiological Status of Women of Reproductive Age (14 - 49 years)

Women of reproductive age should be asked whether they are: pregnant but not breastfeeding, breastfeeding but not pregnant, pregnant and breastfeeding, or not pregnant or breastfeeding. A woman may be unaware that she is pregnant, especially during the first trimester. It is not necessary for interviewers to probe further (such as asking the date of the woman's last menstrual period). The level of error that would be introduced by miscoding a pregnant woman as not pregnant, especially in the first trimester, is not significant in relation to the relatively high level of error in this indicator of household average caloric adequacy.

Figure 4: Sample questionaire for household composition

Member			Age		Physiological status	Activity	Current
ID	Name	Sex	Number	Unit	(women 14-49 years only)	Level	Resident of household? (sleeping/ eating)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1.							
2.							
3.							
Etc							
		1. Male 2. Female		1. Years 2. Months (children < 1 year only)	1. Not pregnant or lactating 2. Pregnant 3. Breastfeeding (child under 6 mo.) 4. Breastfeeding (child 6 mo. or older) 5. Pregnant and breastfeeding (child under 6 mo.) 6. Pregnant and breastfeeding (child 6 mo. or older)	1. High 2. Medium 3. Light	1. Yes 2. No

3.2.4. Current Activity Level

Current activity levels of household members 10 years and older are determined by the interviewer, based on each member's daily activities *during the period that 24-hour recall data is being gathered.* Interviewers must not assume a level of activity based on the member's occupation. It cannot be assumed, for example, that all farmers always have high activity levels. The survey may be being implemented during the off-season, when no agricultural activities are taking place and no alternative employment options are available. In this case, farmers may not be engaged in strenuous physical activity. During the week or two that the interviewer is visiting the household, he or she should determine, based on observation and conversation with household members, each individual's activity level during the period. The Appendix contains examples of light, moderate, and high activity levels.

3.2.5. Current Household Residents

The information recorded in this column is necessary because household members included in the calculation of average household caloric adequacy should be limited to those who are currently consuming from the household food supply. While ideally only such household members will be mentioned by the respondent, it is not uncommon for respondents to list individuals as household members even when they are not currently residing at home. For example, a respondent may list a daughter who is attending school in the capital city and living with a relative. For the respondent, the daughter is still considered to be a member of the

3.

household. Rather than insult a respondent by not recording the daughter's name, the interviewer can record her information, but code her as '2'--not currently residing in the household. If the daughter returns for a visit during the period of interviews, she should be recorded as a "visitor" in the appropriate columns of the questionnaire. Additional motives for collecting household composition data include the need to calculate income per capita or household labor supply. The criteria for listing an individual as "present" or "absent" will differ according to the motive of the survey. For the purposes of calculating caloric adequacy, household members should be included only when currently residing in the household.

4.Analyzing the data

Calculating the percentage of households meeting the minimum standards of daily nutrient requirements entails significant manipulation of data. This section summarizes the steps to be taken to perform the calculations. A more detailed guide to the SPSS/PC programming procedures to be followed is provided in the Appendix. The procedures have been designed for ease and convenience; nonetheless, the CS will probably have to employ or train staff in SPSS/PC so that programs can be debugged and modified as needed.

Once data on the amount of food consumed and the people consuming the food has been collected, the information must be converted to the two data components necessary to quantify household caloric adequacy: *intake and requirements*. Caloric intake is estimated based on the data on consumption of all significant sources of calories during the previous day (see the Appendix). Caloric requirements for household members are calculated based on their age, sex, physiological status, and activity levels (see the Appendix), and the resulting calculation of individual caloric requirements.

Computing caloric adequacy requires a detailed analysis of the composition of each dish consumed by the household, which involves converting ingredients to standard weights; establishing putative recipes for dishes with no recipes; and accounting for leftovers. Using the survey data, the data analyst then proceeds to compute the number of people that consumed each dish and the calories consumed by the household. The average intake of calories is then compared with calorie requirements, to calculate the adequacy of average calorie intake for each household.

Appendix document

A separate Appendix with numerous examples of steps and procedures and information about analyzing the data is available from the FANTA Project. Information is provided on:

- sample ingredient codes
- sample ingredient form codes
- sample unit of measure codes
- sample activities for males and females, grouped by activity level
- row numbers for FAO member countries
- daily calorie requirement for an adult equivalent
- calorie requirement for children under 10 years of age by sex
- average weight by age and sex for FAO member countries
- dietary files
- inputting average recipes for dishes without recipes
- household recipe proportions
- adult equivalent file
- population distribution (proportions) by age and sex for selected countries, 1997
- sample calculation of weighted average adult equivalent ratios for guest categories
- command file containing nutritional value of foods
- Title II generic indicators
- setting food diversity targets